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**Where phonology meets morphology in the context of rapid language change and universal  
bilingualism: Irish initial mutations in Child Language**

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Running head: Irish Initial Mutations in Child Language

## /H1/ Abstract

As one of the Celtic languages, Irish is among the few languages in the world that employ word initial mutations (IMs) in order to express grammatical functions. IMs express grammatical information by way of systematic alternation of minimal phonological contrasts, which closely links segmental phonology to grammatical morphology (Irish also employs final consonant palatalization as a grammatical marker, but this will not be the focus of our paper).

The overwhelming majority of Irish speakers are bilingual (with English), and virtually all Irish-speaking children grow up with varying degrees of exposure to and use of English in the home. Irish is undergoing rapid language change at present, and the system of IM is affected by this process of shift such that many fluent Irish speakers show inconsistent use of IM in their spoken language. Given inconsistency in the use of a grammatical system in the adult language, the question arises whether it will be possible to identify developmental norms for the use of IM in child language. This in turn has clinical implications, in terms of the presence (or absence) of clinical markers of language delay or disorder.

The data we report on consists of narrative samples from typically developing children (aged between 3 and 6) and a group of parents, who completed the same task (telling a story from a wordless picture book). We plot consistency and accuracy IM use in the language of children and parents. A key finding is that inconsistent IM use by parents is mirrored by inconsistent use by children. We discuss clinical implications for language sampling for diagnostic purposes, and the importance of individualized assessment.

Keywords: Irish, morphology, phonology, bilingualism, language change

## /H1/ Introduction

Clinical assessment of child language necessarily involves the notion of a standard of comparison or target variety with which a child's language output can be compared. In many minority languages, evaluation is problematic, since there is a lack of clinical tools for speech-language therapy, as well as a lack of reliable developmental norms that would guide clinicians in the diagnosis of speech or language disorder.

In this paper, we shall present data from Irish, which is spoken as a minority language in Ireland, and co-exists with English as a majority language in a situation of virtually universal bilingualism. In addition, increasing numbers of speakers of other languages (e.g. Polish) have in recent decades moved to Ireland. Our focus will be on the use of the Irish initial mutations (IMs) to signal grammatical information.

## /H2/ A brief sketch of Irish as relevant to this paper

In this section, we focus on aspects of Irish grammar that are relevant for the purpose of this paper. Comprehensive accounts of Irish grammar and phonology can be found for example in Ó Baoill (2009) and Hickey (2014), and the following brief account of Irish grammar is largely based on these two sources. Irish is a Celtic language; its closest relatives are Scottish Gaelic and the revived Manx language. The other family members are Welsh, Breton, and Cornish (also a formerly officially extinct language, which has been revived).

Irish is a VSO language, and in common with other Indo-European languages uses a variety of tools to signal grammatical information, such as: free morphemes (e.g. prepositions, *ar an mbord*, 'on the table'; *faoin mbord* 'under-the table'); systems of affixes (e.g. plural endings on nouns, *madra* – *madraí*, 'dog – dogs'; person/tense endings on verbs, *cuir-im* 'I put'; *cuir-eann* 's/he, it puts'); suppletion (*tá* 'is'; *bhí* 'was'). Irish also uses a system of alternation between palatalized and non-palatalized morpheme-final consonants to signal for example case (*crann*, 'tree' nom.sg. vs. *crainn*, gen.sg.). Unique among the Indo-European languages is the use of IMs, that is, the

systematic use of phonological minimal pairs or groups to express grammatical information. While the different Celtic languages share the principle of IMs, the systems are language specific (see e.g. the relevant language chapters in Ball & Müller, 2009). Table 1 presents an overview of the Irish consonant system. Tables 2 and 3 represent a sketch of the effect of IMs on word-initial consonants.

[Table 1 about here]

[Table 2 about here]

[Table 3 about here]

Consonant mutations exhibit two different systems, that of lenition and that of eclipsis or nasalization (different sources use different terms to refer to this system, Hickey (2014) preferring ‘nasalization’, while Ó Baoill (2009) refers to ‘eclipsis’). The effect of lenition is essentially that of a ‘weakening’ in articulatory force, as suggested by the term. Fortis plosives are lenited to fortis fricatives, which are (near) homorganic at the bilabial, palatal place of articulation, while the dental/alveolar plosives and the alveolar/alveopalatal fricatives merge in lenition, as do the dental/alveolar and velar plosives, and the bilabial lenis plosives and nasals. Lenited labiodental fricatives are realized as zero (resulting in vocalic or approximant word onset).

Eclipsis presents a somewhat more regular pattern, such that eclipsed fortis plosives are their homorganic lenis counterparts, whereas eclipsed lenis plosives are homorganic nasals, and the labiodental fortis fricatives are eclipsed to bilabial / labiodental.

Certain grammatical categories (of which more below) that trigger consonant mutations also affect word-initial vowels. Vowel-mutation involves prefixing of /h/, prefixing of /t, tʲ/ to a word-initial vowel (or /s, ʃ/ followed by /l, n, r/ or their palatalized counterparts), prefixing of /n, nʲ/, and prefixing of /d, dʲ/.

IM occur across the range of grammatical categories, including for example verb inflection, case, number and gender marking in the noun phrase, following prepositions, and numerals. It would lead us far beyond the scope of this paper to illustrate all contexts that involve the use of IM; detailed descriptions can be found in Ó Baoill (2009) and Hickey (2014), and Stifter (2009) includes information on historical linguistic development. Below, we give examples of the specific IM contexts that are the object of investigation of this paper<sup>1</sup>.

### /H3/IM indicating past tense (positive declarative)

In the past tense (as well as in the imperfect and the conditional)<sup>2</sup>, Irish verbs undergo initial lenition or /d, dʲ/-prefixing:

- (1) root: *bris-* /bʲrʲiʃ/ 'break'      past tense: *bhris sí* /vʲrʲiʃ ʃi:/ 'she broke'  
       root: *ól-* /o:l/ 'drink'      past tense: *d'ól sí* /do:l ʃi:/ 'she drank'

In the absence of a suffix, IM is the sole marker of the past tense in positive declarative clauses (in non-declarative and negative clauses, Irish uses preverbal particles that indicate clause function as well as tense, in conjunction with IM).

### /H3/IM with possessive determiners

The possessive determiners of the 1<sup>st</sup> and 2<sup>nd</sup> person singular cause lenition, as does the 3<sup>rd</sup> person masculine, while the 3<sup>rd</sup> person feminine prefixes /h/ to vowels. The plural possessive determiners are followed by eclipsis. (The base forms here are *cat*, *fear*, *éan*, /kʌt/, /fʲar/ /e:n/, 'cat', 'man', bird'.)

- (2) 1sg      *mo chat*, *m'fhear*, *m'éan* /mə xʌt/, /mʲar/, /mʲe:n/      'my cat, man, bird'  
       2sg      *do chat*, *d'fhear*, *d'éan* 'your'

<sup>1</sup> We use spelling conventions rather than phonemic transcription in most of the examples, since spelling conventions are a more reliable indicator of IM for readers not familiar with Irish grammar (e.g. #<ph> always indicates the presence of lenition, whereas #/f/ can either represent a lenited /p/, or an unmutated /f/).

<sup>2</sup> We shall only focus on past tense forms in this paper, since both imperfect forms and conditionals are rare in child narratives. Note that in contexts other than the positive declarative ('she broke'), Irish verbs are preceded by pre-verbal particles that also trigger IM; these have been excluded from the present analysis because of the scarcity of target tokens in the narrative data on which this paper is based.

3sg.m	a chat , a fhear , a éan	‘his’
3sg.f	a cat , a fear , a héan /ə he:n/	‘her’
1pl	ár gcat , ár bhfear , ár n-éan	/a:r gʌt/, / a:r vʲar/, /a:r nʲe:n/ ‘our’
2/3pl	bhur, a gcat , bhfear , n-éan	‘your-pl, their’

The third person possessive determiners all have the form *a* /ə/, and are disambiguated by IM only. (In addition, the 1<sup>st</sup> and 2<sup>nd</sup> person plural possessives also tend to be reduced to /ə/ in pronunciation (Ó Siadhail, 1980) in traditional Irish.)

#### /H3/IM following prepositions

The majority of simple (i.e. non-compound) prepositions in Irish cause lenition when directly followed by a noun, but eclipsis occurs when the noun is preceded by the definite article.<sup>3</sup> Examples are *ar chathaoir* / *ar an gcathaoir* ‘on a chair / on the chair’, *faoi bhord* / *faoi mbord* ‘under a table / under the table’. Exceptions are for example: *as* ‘out of’ (no lenition), *de* ‘of, from’ and *do* ‘to’ (both *de* and *do* lenite with and without definite article, e.g. *cuid de bhalla*, *cuid den bhalla* ‘a piece of a / the wall’), *i* ‘in, into’ (eclipses: *i bpoll* ‘in a hole’, definite form *sa* ‘in the’ lenites or eclipses, depending on regional variant), and *le* ‘with’ (prefixes /h/ to vowels, eclipses with the definite article, *le hÚna*, *leis an mbosca*, ‘with Úna, with the box’).

#### /H3/IM following the definite article

Irish has a definite article (but no indefinite article), which triggers IM on the following noun depending on gender, case and number, as well as the initial segment of the noun. Table 4 presents a summary of the patterns.

[Table 4 about here]

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<sup>3</sup> According to Hickey (2014), either lenition or eclipsis are acceptable in official Standard Irish, following preposition+article. However in the western Irish variety (Co. Galway) on which this paper is based, eclipsis is preferred in this context.

As can be seen from this brief sketch, there are regularities in terms of the grammatical contexts in which IM occur. However the patterns vary depending on the phonological context (i.e. the initial segment of the word undergoing IM), and there are also exceptions (e.g. not all prepositions take the same IM). The patterns described above are based on what some authors describe as ‘traditional Irish’, that is, the Irish spoken by L1 speakers born up to roughly the 1960. At present, the Irish spoken by younger generations is undergoing rapid language change, and is being increasingly influenced by English. This results in significant intergenerational differences both in terms of language structure, and language use (Lenoach, 2012; Ó Catháin, 2016; Péterváry, Ó Curnáin, Ó Giollagáin, & Sheahan, 2014). In addition, there is a degree of fluidity in the use of grammatical features by young speakers of Irish, which makes comparison particularly of children’s Irish language output difficult in relation to official and regional standards (as described in e.g. Ó Siadhail, 1989). We have chosen to focus on IM in this paper, since they are an interesting test case for the investigation of how consistently grammatical features are used across generations of bilingual native speakers. We therefore analyse the use of IM in language produced by parents, and by children, in a narrative task. In order to minimize regional dialectal variation, we focus on a specific geographic region in the west of Ireland (Co. Galway), with a high proportion of the population using Irish as a community language on a daily basis.

## /H2/Use of Irish: The current situation

Irish has the status of primary official language in the constitution of the Irish Republic, official-language status in the legislation of the European Union and receives different forms of state support in Ireland (see Ó Catháin, 2016; Ó hIfernáin, 2009 for more details). However, even though according to the Census of 2016, 39.5% of the population can speak Irish, only 1.7% (73,803 individuals) do so on a daily basis, outside of the education system. The highest density of Irish speakers lives in the traditionally Irish-speaking or *Gaeltacht* regions, in the mainly rural areas on the



north-western, western and south-western seaboard. In those officially designated Irish-speaking communities, 66.3% of the population (66,664 individuals) stated they could speak Irish, but those using Irish daily don't account for more than 62% in any one district (with an averages of 21.4%). The number of daily Irish speakers in those communities continues to decline. For example, the *Gaeltacht* areas in County Galway, where data for the current study were collected, saw a decline of 6.3% between the 2011 and 2016 Census. Even in the *Gaeltacht* areas, there is almost universal bilingualism with English, and there are virtually no monolingual Irish language environments. Children are typically exposed to English through their wider community, extended family, education, as well as through various services that are usually not available through Irish (Hickey, 2016; Hickey, 2007; Stenson, 1993).

Children growing up in *Gaeltacht* areas typically attend local Irish-medium schools and preschools. However, there is significant variation in the amount of Irish spoken in different education settings. Due to demographic changes of the *Gaeltacht* regions children attending schools and preschools may come from Irish dominant, mixed and English dominant homes, and depending upon the location of any one school or preschool, children from Irish dominant homes may be in a minority in the classroom (Hickey, 1999; Mac Donnacha, Ní Chualáin, Ní Sheaghda, & Ní Mhainín, 2004; Péterváry et al., 2014).

## /H2/ Quality of language exposure as related to IM

In addition to the influence of the quantity of exposure on language acquisition that has been well documented in the literature (e.g., De Houwer, 2007; Gathercole & Thomas, 2009; Grüter & Paradis, 2014; Paradis, 2017; Thomas, Williams, Jones, Davies, & Binks, 2014), an increasing number of studies look at different aspects of the quality of language exposure, including different characteristics of child directed speech (Thomas et al., 2014; Paradis, 2017). Particularly relevant to the current study are the opaqueness of morphosyntactic paradigms (Nic Fhlannchadha & Hickey,

2017; Gathercole & Thomas, 2009; Thomas et al., 2014) and consistency of use of particular forms in child directed speech (Thomas et al., 2014).

As illustrated above, morphosyntactic forms in Irish are complex involving opaque form-to-function mappings. Consistency in form-to-function mapping refers to whether a particular grammatical or semantic function is encoded in one or multiple morphosyntactic forms (Paradis, Tremblay, & Crago, 2014). A number of studies have indicated that opaque form-to-function systems lead to protracted acquisition (Gathercole & Thomas, 2009; Paradis et al., 2014; Thomas & Gathercole, 2007; Thomas, Williams, Jones Davies & Binks, 2014). For example, research on Welsh, another Celtic language that is a minority language with English as the majority language, examined opaque and inconsistent systems of grammatical gender and plural (Gathercole & Thomas, 2009; Thomas et al., 2014). Although both plural and gender paradigms showed protracted acquisition, differences were observed between individual forms that involved different types of expression. The study of grammatical gender (Gathercole & Thomas, 2009) found that soft mutation was acquired earlier than aspirate mutation (see Ball & Müller, 1992) for details on the Welsh IM systems).<sup>4</sup> In comparison to aspirate mutation, soft mutation is more frequent as it affects a larger number of consonants and occurs in more grammatical contexts. Aspirate mutation is inconsistently used in the adult language, which makes form-to-function mapping even more difficult. With respect to the plural system in Welsh, Thomas et al. (2014) found that the forms requiring addition of a plural suffix were easier to acquire than the forms that are infrequent and involve subtle, word-internal gphonemic changes.

Similarly to the studies on Welsh, Nic Fhlannachadha and Hickey (2017) found evidence for incomplete and protracted acquisition of the complex and opaque gender system in Irish. Their participants had not fully mastered the gender paradigm by the age of 13, and their use of IM to indicate gender with

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<sup>4</sup> Soft mutation in Welsh changes initial fortis plosives to lenis, lenis plosives to lenis fricatives (although /g/ deletes), fortis liquids to lenis, and /m/ to /v/. Aspirate mutation changes initial fortis plosives to fortis fricatives.

the 3<sup>rd</sup> person singular possessive was considerably more accurate than their use of IM to indicate gender in noun phrases.

## /H2/Research questions

This paper aims to answer the following research questions: 1) Does IM use by the adults in the study differ from traditional Irish standards, and if so, how? 2) Is the adults' use of IM consistent? 3) Does the children's use of IM differ from that of the adults? 4) Can patterns be identified in IM use, relative to communicative function?

## /H1/Methods

Ethical approval for the study was granted by the Research Ethics Committee at the National University of Ireland Galway.

## /H2/Participants

Thirty-two children from three age groups (3+, 4+, 5+ years) participated in the study. All were typically developing bilingual Irish-English speakers predominantly exposed to Irish (see Table 5). The participants were recruited from primary schools and preschools in the Co. Galway *Gaeltacht*. Participants' information was gathered using a language background, and early health and development parental questionnaire. The children passed a hearing screening, and none of them achieved a non-verbal score of less than one standard deviation below the mean on the Core Performance subtests of the *WPPSI -III<sup>UK</sup>* (Wechsler, 2002) (administered through Irish, for screening purposes only).

The proportion of Irish exposure from birth, as well as current exposure to Irish were calculated. The proportion of Irish exposure from birth was expressed as a ratio of the estimated number of hours of exposure to Irish relative to the number of a child's waking hours in the period

between 0 and 12 months. Current exposure refers to the time around data collection and comprises exposure to Irish at home, in other social contexts and hours spent in formal education. At the time of data collection all but three children were in formal education delivered through Irish; however since they were spread across sixteen different class groups in twelve preschools and schools, we may assume that there was some diversity in terms of language exposure that we were not able to capture. A caveat relating to the use of parent questionnaires to information on the relative proportion of exposure to different languages is that parents may not be able to reliably estimate how much time is spent speaking during time spent with a child (see e.g. Grüter and Paradis, 2014). Thus the figures in table 5, which indicate a slightly lower current proportion of exposure to Irish for the youngest and the oldest age group (compared to exposure from birth) have to be taken as a rough approximation. However, all participating families attest that they use Irish with their children most of the time, and that Irish is the main language used in the home.

[Table 5 about here]

The parent group consisted of 19 mothers and 1 father, aged 29-43 years ( $M=36.39$ ;  $SD=4.12$ ). All were native speakers of the regional variety of Irish. Thirteen of the parents had post-secondary education (ISCED level 4 or higher), while seven had completed secondary education (ISCED level 3 or 2).

## /H2/Procedure

The wordless picture book “Frog, where are you?” (Mayer, 1969) was used to elicit narratives from both children and parents. Children were asked to retell the story, while the parents’ task was to tell the story to their own children, supported by the picture book. The children were also asked to retell the story from a second wordless picture book, developed by the second author as a continuation of

“Frog, where are you”, in order to elicit specific grammatical forms (such as the present tense inflection of regular and irregular verbs, nominative plural, and genitive singular of nouns).

Narratives were used because they provide a rich source of data about a child’s language use in a relatively natural and ecologically valid context, allowing for microstructure analysis that can be focused on different elements, including morphosyntax, and use of phonology (Botting, 2002; Heilmann, Miller, & Nockerts, 2010; Heilmann, Nockerts, & Miller, 2010). Narrative is considered to have particular merit in assessing minority language production as it provides a more holistic view of language skills than more formal elicitation tasks (Stockman, 1996).

The second author conducted all data collection with the children. The first session consisted of a hearing screening test and the Core Performance subtests of the *WPPSI -III<sup>UK</sup>* administered through Irish (for screening purposes). Children between 3;0 to 3;11 completed the *Block Design* and *Object Assembly* subtests while children aged 4;0 and older completed the *Block Design*, *Matrix Reasoning* and *Picture Concepts* subtests (Wechsler, 2002). The second session consisted of narrative retell. Each child was asked to retell first “Frog, where are you?” (Mayer, 1969), told by the researcher in Irish, while looking at the pictures. This procedure was repeated for the second story, which was presented in the same fashion, using a 15-page original picture book. The child's narration of each story was audio-recorded and later transcribed by the second author.

A deliberate choice was made to use Irish words and structures even though for some children, their English equivalents might have been more frequent in their daily language use. This was done in order to encourage Irish words and structures from the children if they were in their repertoire. This most likely gave an unrealistic picture with respect to code switching; however, the primary focus of the study was Irish morphosyntax (including IM), rather than code switching patterns.

In order to collect data from the participating parents, each was asked to look through the “Frog, where are you?” picture book and tell the story to their own child(ren), in their own homes (these sessions were also audio recorded). They were advised to allow their children to ask

questions, make comments and participate in other ways in the storytelling. The parents were asked to begin their story with the words *uair amháin bhí* ‘once ... there was...’ or simply *bhí* ‘there was...’ in order to prompt a story told in the past tense.

## /H1/Results

The results presented here focus specifically on the use of IM in the narratives produced by children and members of their parents’ generation. This is part of a larger study agenda aimed at analysing the morphology and syntax of young bilingual Irish speakers. Elicitation of data by means of wordless picture books has the advantage, as mentioned above, that story telling is part of the typical repertoire of language use patterns of children and parents. In addition, the use of the picture book represents a degree of uniformity in terms of the vocabulary used. A drawback of this method is that it elicits a limited repertoire of grammatical contexts for IM, precisely because the vocabulary is constrained by characters and settings, and narratives tend towards high proportions of positive declaratives, rather than the use of negatives, or questions, for instance.

## /H2/Use of IM with verbs

For all three age groups, the use of IM to indicate past tense yielded enough data to reveal patterns across the groups. The use of IM following pre-verbal particles did not yield many data points among the children, which is not surprising, given the nature of the task: Pre-verbal particles in Irish are used in sentence forms other than the positive declarative (e.g. negative declarative, interrogative, or complement clauses), which are common in conversational speech, but less so in narratives.

[Table 6 about here]

As can be seen from Table 6, the children in all three age groups produced lenition to indicate past tense on regular verbs in the overwhelming majority of obligatory contexts accurately, which is consistent with the parents' output. The use of d-prefix with vowel initial verbs (the equivalent to lenition of consonants as a marker of past tense) was also high across groups. The parents did not use English verbs (perhaps because they were mindful of the research context), while children in the two older age groups did. Use of lenition with English verb roots was markedly lower than with Irish verbs.

#### /H2/Use of IM with possessives

As mentioned above, possessive adjectives in Irish may take lenition, eclipsis, h-prefix, or no mutation. The 3<sup>rd</sup> person singular and plural possessive determiners all take the form <a>, /ə/, and are disambiguated by mutation (see example 2 above). In our data set, only the 3<sup>rd</sup> person singular masculine possessive occurs across all groups (see table 7).

[Table 7 about here]

Similar to the use of lenition with the past tense of regular Irish verbs, accuracy in this IM context is high, although the higher SD in the children's data point to a relatively higher degree of variation in accuracy between individuals.

#### /H2/ Use of IM with prepositions

When following a preposition, the definite article (with most simple prepositions) triggers eclipsis (an exception is *don* 'to-the', which is accompanied by lenition or t-prefix of s-initial nouns, respectively; instances of *don* are not included in table 8). *Sa* represents the preposition *i* 'in(to)'+definite article. In both parents' and children's narratives, accuracy in the use of IM in the context of prepositions is lower than with the past tense of regular verbs, or with possessives. For all

groups, parents and children, *sa+eclipsis* is used accurately more often than other prepositions followed by the definite article. However, in the parent group, the high SD indicates comparatively high individual variation (i.e. spread around the mean). Accurate use of *sa*, and eclipsis following other simple prepositions+definite article among 4-5 and 5-6 year-olds is comparable, while the 3-4 year olds achieve markedly lower accuracy rates. It is noteworthy that even among the oldest group of children, accuracy of IM use in this context does not reach 50% of all obligatory contexts in the data. IM is only rarely used with English nouns, and only the parents and youngest children produced English nouns in relevant mutable contexts in our data.

Many, though by no means all, simple prepositions directly preceding nouns trigger lenition, while some trigger no mutation, and the preposition *i* 'into', is followed by eclipsis (see above). In our data, accurate use of IM accounts for just over half of obligatory contexts in the parent group, and is marginal in the children's groups (see table 8).

[Table 8 about here]

## /H2/ Use of IM with the definite article: noun gender

Noun gender is a factor that determines the use of IM following the definite article *an* 'the' in the nominative and genitive singular of nouns (see table 4 above), while no gender distinction is indicated by IM with the plural article *na*. Our data only include sufficient obligatory contexts for analysis in the nominative case. While the parents' use of IM is accurate in a majority of cases, the high SD points to a high degree of variation. The children's narratives show low accuracy overall, with only the oldest age group approaching one third accuracy (see table 9)

[Table 9 about here]

## /H2/Summary of results



English verbs and nouns only rarely undergo IM in our data. The only categories of IM to yield tokens for analysis was the use of past tense lenition of verbs, and Preposition+article+IM. Only children in the 5-6 and 4-5 year age groups used English verbs, and past tense lenition was applied to less than half of all tokens in the former group, and just under a third, in the latter (note also that only half of the children in each group used English verbs). Use of IM following preposition+article with English nouns was virtually absent from the children's narratives (though 6 children in each age group used preposition+article with English nouns), and in the parents' narratives, only 24% of all possible tokens underwent IM.

For use of IM with Irish nouns and verbs, figure 1 presents a summary comparison of IM accuracy across the participant groups (including those IM categories for which the narratives yielded sufficient data for comparison).

[Figure 1 about here]

Figure 1 illustrates that across all four participant groups, IM indicating the past tense of regular verbs (lenition, and d-prefix for verb roots beginning with a vowel), as well as lenition accompanying the 3<sup>rd</sup> person singular masculine possessive (*teach* 'house'; *a theach* 'his house') show the greatest degree of accuracy. Even with the youngest age group, these categories are produced with above 80% accuracy, and can thus be deemed to have been acquired by the children. The other categories of IM analysed here show greater inconsistency among the parent group (as evidenced by larger standard deviations; see tables 8-9), and the only one produced with greater than 80% accuracy is *sa*+eclipsis 'in-the', followed by IM triggered by noun gender (following the article in the nominative case; see table 9), with 75%. In the children's narratives, *sa*+eclipsis also shows the highest proportion of accuracy, but even the oldest age group only achieves 48% accuracy. Thus none of the IM categories analysed here other than IM indicating past tense, and

lenition following the 3<sup>rd</sup> sg masculine possessive can be described as having been mastered by the children.

/H1/Discussion

/H2/Language change and incomplete acquisition, or protracted acquisition?

As discussed in the introduction, there have been several studies investigating the acquisition and use of Irish as a first language in the context of virtually universal bilingualism (e.g., Nic Fhlannchadha & Hickey, 2017; Péterváry et al., 2014). Some of this research has come to the conclusion that (traditional) Irish is being acquired incompletely by recent and contemporary cohorts of bilingual L1 speakers, and that structural gaps in Irish are filled by reference to the model provided by English (see Lenoach, 2014). Our data point towards a weakening of the Irish IM system in contemporary, informal spoken Irish among bilingual L1 speakers. Further, if we may make the assumption that our data are sufficiently representative, we can document a shift towards inconsistent use of IM already in the parents' generation (who were born in the 1970s). Thus the parents' use of IM does differ from standards of accuracy in traditional Irish: Some of the categories analysed here are used accurately in almost all obligatory contexts (see above), while others achieve only between 55% and 75% accuracy. The overall less accurate (on average) categories also show greater intra-group, and intra-individual inconsistency.

The children's use of IMs shows clear parallels with the parents' data: those categories used most accurately and consistently among the parents are also the most accurate in the children's narratives. The circumstance that in our child data, only past tense IM and lenition following the 3sg masc. possessive can be said to have been mastered by the children may on the one hand strengthen the argument that language change and structural simplification (towards avoidance of IM) is indeed afoot in contemporary spoken L1 Irish. On the other hand, it is probably also an indication that acquisition of the IM system in Irish is a protracted process, which at age 5-6 is still underway. It has been shown that in Welsh, acquisition of the IM system continues until well into

school age (e.g. Gathercole & Thomas, 2009). However, the circumstance that some Irish IM categories are not used consistently among the parents' generation does point towards an erosion of the IM system.

#### /H2/Communicative function, complexity and opacity

Our data (albeit limited in scope) points towards a pattern whereby the robustness of IM use is supported by a) comparatively stronger communicative function, and b) comparative simplicity and transparency (less complexity and opacity) in IMs' contribution to the expression of any one grammatical category.

Overall, the communicative function of IM (i.e. their contribution to grammatical or semantic meaning) is low. In addition, the same forms (e.g. lenited consonants) map onto multiple functions, depending on grammatical context, some of which could be described as contradictory (for instance, lenition indicates *feminine* noun gender following the *nominative singular* article, but *masculine* noun gender following the *genitive singular* article), and the same function (e.g. past tense) is expressed by multiple forms (lenition of lenitable consonants and d-prefix of vowel-initial roots in positive declarative clauses, and preverbal particle+lenition in negative and non-declarative clauses; see e.g. (Ó Baoill, 2010). Thus the IM system is both complex and opaque overall.

The 3<sup>rd</sup> person possessive adjective *a*, 'his, her, their' (depending on mutation) is an exception to these tendencies, and in our data, lenition following the 3<sup>rd</sup> sg. masc. possessive (the other 3<sup>rd</sup> person possessives did not yield sufficient obligatory contexts) is indeed among the most accurately used categories of IM among both parents and all three age groups of children (confirming results reported by Nic Fhlannachadha & Hickey, 2017). In addition, gender in the context of possession potentially disambiguates propositional meaning inasmuch as it can uniquely identify a previously-mentioned referent. However, gender in the context of a noun phrase is semantically redundant in the absence of potential minimal pairs. Noun gender in Irish, as indicated by IM, is highly complex and opaque, in that it interacts with number and case (see table 4 above). In

our data, the parents' use of IM to indicate feminine gender in the nominative case is only accurate in 75% of obligatory contexts, and even the oldest age group of children only score 31% accuracy, with high SDs indicating high variability within each group.

In contrast, the use of lenition or d-prefix to indicate the past tense of verbs comparatively transparent, and a stronger communicative function. In the regular past tense, lenition / d-prefix is the sole marker of tense/mood, in the absence of a verb ending, and thus contrasts with the bare root of the verb, which also serves as the 2<sup>nd</sup> person sg. imperative (*glan*- 'clean'; *glan an fhuinneog!* 'clean the window!'; *ghlan sé an fhuinneog* 'he cleaned the window'; *ól*- 'drink'; *ól cupán caife!* 'drink a cup of coffee!'; *d'ól sé cupán caife* 'he drank a cup of coffee').<sup>5</sup> The high accuracy rate among both parents and all three groups of children appear to point towards a role of both simplicity and consistency of pattern, combined with communicative function, in both the acquisition and maintenance of IM to signal grammatical patterns.

The other IM contexts we have examined in this paper involve prepositions. In the context of prepositions, the communicative function of IM can be considered as negligible. In the parents' narratives, the lowest accuracy scores were achieved in the category preposition+noun. Parents also exhibited high variability in the use of this IM category. In any one group of children, this was also the lowest-scoring category, with high variability. IM of a noun directly following a preposition can be described as lexically triggered and is highly inconsistent as a category, since different simple prepositions trigger different (or no) IM. Definite prepositional phrases, i.e. preposition+article+noun are, as a context of IM, somewhat more consistent than indefinite ones, in that (in the regional variety under investigation), all simple prepositions in this context, with the exception of *de* 'of, from' and *do* 'to' (which trigger lenition), trigger eclipsis (however, noun-initial

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<sup>5</sup>This distinctive role of the IM in distinguishing grammatical function however only prevails between positive declarative and positive imperative, since negative and non-declarative forms come with paradigms of pre-verbal particles that distinguish between past and non-past (e.g. *níor ghlan sé an fhuinneog* 'he didn't clean the window' versus *ní ghlanann sé* 'he doesn't clean' versus *ná glan!* 'don't clean!').

dental/alveolar plosives are not eclipsed in this context). The category *sa*+eclipsis was separated out from the other prepositions, since *sa* 'in the' stands in a (synchronically) suppletive relationship to *i* 'in' (and is the only simple preposition to have an opaque, suppletive definite form). We can see from our results that both the parents, and the three children's groups achieve higher accuracy scores with this lexically invariant form than with the other prepositional contexts, but with the children, accuracy remains below 50%.

/H2/A combined effect of older-generation inconsistency, system complexity, and weak communicative function?

The consistently accurate (by traditional Irish standards) of IM use by the parental generation, as represented by the 20 adult participants in this study appears to pattern according to both system complexity and opacity and communicative function, as detailed above. In the children's data, the IM categories that can be considered as having been mastered even among the youngest group are those that a) are used most consistently among the parents, b) follow comparatively simple patterns, and c) have a comparatively stronger communicative function.

Opacity of form-to-function mapping, as well as system complexity or consistency have been discussed as factors in language acquisition in a number of studies (see above). Our findings are consistent with previous research inasmuch as opacity and complexity appear to contribute to protracted development, and potentially, as evidenced by the language produced by the parent group in our study, inconsistent use into adulthood of certain grammatical categories. However our study may point to an additional effect, namely that of consistency of use in parental language as a factor in protracted, or incomplete, acquisition. While system opacity and complexity, and communicative function may be factors in the inconsistent use of IM in the parents' generation, their inconsistent use may in turn be an additional factor in the next generations' acquisition and use of IM. This in turn has important clinical implications.

## /H1/Clinical implications and conclusions

Most, if not all, minority languages are under-researched and under-served when it comes to clinical assessment tools. Irish is no exception to this tendency, and to date there are no norm-referenced assessments of speech or language in Irish. In many minority language communities, bilingualism with the majority language is increasingly becoming the norm, which would make the use of norm-referenced assessments highly problematic even if they existed. Most majority languages that co-exist with English as majority language have more complex grammatical systems; this is the case for example for the languages (both indigenous and immigrant) of Ireland and the UK, Native American and First Nations language in the USA and Canada, Spanish in the USA, indigenous languages of Africa in post-colonial co-existence with English, and many others. In such majority-minority situations, language change of the minority language implies simplification and approximation towards the majority system, and, as is the case with Irish, language change between generations can be rapid.

Such sociolinguistic tendencies are relevant to clinical practice. In the presence of rapid language change within communities of language users, established language standards reflected in, for instance, literary usage, may no longer be valid to describe what is accurate or acceptable according to community language use. In situations where a child's language exposure profile, or a community's language practices, do not neatly fit into mainstream assessment practices, dynamic assessment is often recommended, since it accesses a child's ability to learn the expression of e.g. a grammatical category (see e.g. (Hasson, Camilleri, Jones, Smith, & Dodd, 2013; Lidz & Peña, 1996). However, dynamic assessment lends itself rather better to categories that are expressed consistently and with relatively simple systems (i.e. few exponents of a category). In addition, dynamic assessment in the final instance also rests on the assumption that reference can be made to a valid standard of comparison.

On the basis of this study, as well as sociolinguistic studies of Irish, it appears that some categories of Irish IM are no longer completely acquired (such as IM following prepositions). Future

research will show whether they may be emerging as sociolinguistic or register variables (to indicate, for instance, degrees of formality). In the meantime, it would be inappropriate to interpret inconsistency in usage among children as indicating language disorder or delay. Our data point to consistency (or lack thereof) in the use of IM among the parents' generation as a potential factor in children's language use. Thus, in order to do justice to the linguistic development and reality of children growing up in situations where bilingualism is universal, and where language is changing rapidly, clinicians will need to take the language of the children's environment into account. In the present study, we only had access to 20 adult participants, who were a sub-set of parents of our child participants. For future reference, it would be useful to investigate the language of older children and adolescents in the same communities, also. Many clinicians will baulk at the time and effort required (in addition to the linguistic training and knowledge) to analyse language samples from both parents and children, in the context of long waiting lists for services and insufficient time allocated to each individual case. However, where clinicians can partner with researchers is, for example, in the identification of language features that emerge as comparatively solid across generations, even from samples of limited scope.

#### /H1/ Statement of Interest

The authors report no conflicts of interest.

#### /H1/Acknowledgment:

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Table 1: Irish contrastive consonants

	labial	dental / alveolar	palatal	velar	glottal
plosives	p, p <sup>j</sup> , b, b <sup>j</sup>	t, t <sup>j</sup> , d, d <sup>j</sup>	c, ɟ	k, g	
nasals	m, m <sup>j</sup>	n, n <sup>j</sup>		ŋ	
fricatives	f, f <sup>j</sup> , v <sup>j</sup>	s, ʃ	ç	x, ɣ	h
approximants	β	l, l <sup>j</sup>	j		
rhotic		r, r <sup>j</sup>			

Table 2: Irish IM: Lenition

Unmutated consonant		Lenited consonant	
Phonemes	Spelling <sup>1</sup>	Phonemes	Spelling
k, c	c	x, ç	ch
p, p <sup>j</sup>	p	f, f <sup>j</sup>	ph
f, f <sup>j</sup>	f	zero	fh
b, b <sup>j</sup> , m, m <sup>j</sup>	b, m	β, v <sup>j</sup>	bh, mh
d, d <sup>j</sup> , g, ɟ	d, g	ɣ, j	dh, gh
t, t <sup>j</sup> , s, ʃ	t, s	h, ç	th, sh

<sup>1</sup> Note that palatalized consonant phonemes in Irish spelling are indicated by adjacent <e> or <i>

Table 3: Irish IM: Eclipsis / Nasalization

Unmutated consonant	Eclipsed / nasalized consonant	Spelling
fortis plosive	homorganic lenis plosive	bp, dt, gc
lenis plosive	homorganic nasal	mb, nd, ng
f, f <sup>j</sup>	β, v <sup>j</sup>	bhf

Table 4: IM following the definite article<sup>1</sup>

	Nominative Singular	Genitive Singular	Nominative Plural	Genitive Plural
Masculine	<p>Consonant initial: no mutation <i>an gasúr</i> ‘the child’</p> <p>Vowel initial: /t, tʲ/-prefix <i>an t-arán</i> ‘the bread’</p> <p>S-initial<sup>2</sup>: no mutation <i>an samhradh</i>, ‘the summer’</p>	<p>Consonant initial: lenition <i>hata an ghasúir</i> ‘the child’s hat’</p> <p>Vowel initial: no mutation <i>blas an aráin</i> ‘the taste of the bread’</p> <p>S-initial: /t, tʲ/-prefix <i>deireadh an tsamhraidh</i> ‘the end of the summer’</p>	<p>Consonant initial: no mutation <i>na gasúir</i> ‘the children’</p> <p>Vowel initial: /h/-prefix <i>na héin</i> ‘the birds’</p> <p>S-initial: no mutation <i>na sráideanna</i> ‘the streets’</p>	<p>Eclipsis of all affected consonants, and of vowels</p> <p><i>hataí na ngasúr</i> ‘the children’s hats’</p> <p><i>ceol na n-éan</i></p>
Feminine	<p>Consonant initial: lenition <i>an fhuinneog</i> ‘the window’</p> <p>Vowel initial: no mutation <i>an aill</i> ‘the cliff’</p> <p>S-initial<sup>2</sup>: /t/-prefix <i>an tseachtain</i> ‘the week’</p>	<p>Consonant initial: no mutation <i>fráma na fuinneoge</i> ‘the window(‘s) frame’</p> <p>Vowel initial: /h/-prefix <i>mullach na haille</i> ‘the top of the cliff’</p> <p>S-initial<sup>2</sup>: no mutation <i>deireadh na seachtaine</i> ‘the week(‘s) end’</p>	<p>Consonant initial: no mutation <i>na fuinneoga</i> ‘the windows’</p> <p>Vowel initial: /h/-prefix <i>na haille</i> ‘the cliffs’</p> <p>S-initial<sup>2</sup>: no mutation <i>na seachtainí</i> ‘the weeks’</p>	<p>Eclipsis of all affected consonants, and of vowels</p> <p><i>frámaí na bhfuinneog</i> ‘the frames of the windows’</p> <p><i>mic léin na n-ollscoileanna</i> ‘the universities’ students’</p>

<sup>1</sup>Some examples are taken from Hickey (2014); <sup>2</sup> “s-initial” here refers to: /s, ʃ/ followed by /l, lʲ, n, nʲ, r, rʲ/

Table 5: Profile of child participants

Age group	Number of children	Mean age in months (SD)	Mean proportion Irish exposure since birth (SD)	Mean current proportion of Irish exposure (SD)
3-4	10 (3 male)	41.40 (3.37)	0.93 (0.07)	0.82 (0.17)
4-5	12 (5 male)	54.58 (3.26)	0.95 (0.06)	0.94 (0.08)
5-6;4	10 (5 male)	67.00 (5.98)	0.94 (0.05)	0.90 (0.08)

Table 6: Use of IM with verbs to indicate past tense

	Parents		5+ years		4+ years		3+ years	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Past tense lenition (regular verbs)	0.99	0.03	0.86	0.28	0.92	0.09	0.95	0.86
Past tense lenition (English verbs)			0.4	0.45	0.78	0.32		
Past tense d-prefix	1		0.97	0.09	0.96	0.67	0.81	0.35



Table 7: Use of IM with 3<sup>rd</sup> person singular masculine possessive

	Parents		5+ years		4+ years		3+ years	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
3 sg masc poss + lenition	0.97	0.08	0.93	0.2	0.82	0.2	0.81	0.18

Table 8: Use of IM with prepositions

	Parents		5+ years		4+ years		3+ years	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Preposition + article + eclipsis	0.7	0.35	0.25	0.25	0.27	0.39	0.12	0.16
<i>sa</i> + eclipsis	0.84	0.22	0.48	0.45	0.42	0.47	0.26	0.33
Preposition + article + IM (English noun)	0.24	0.39	0	0	0	0	0.06	0.12
Preposition + IM (Irish noun)	0.55	0.4	0.09	0.16	0.2	0.33	0.1	0.2

Table 9: Use of IM to indicate noun gender

	Parents		5+ years		4+ years		3+ years	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD
Nominative singular following article	0.75	0.3	0.31	0.42	0.19	0.33	0.11	0.31

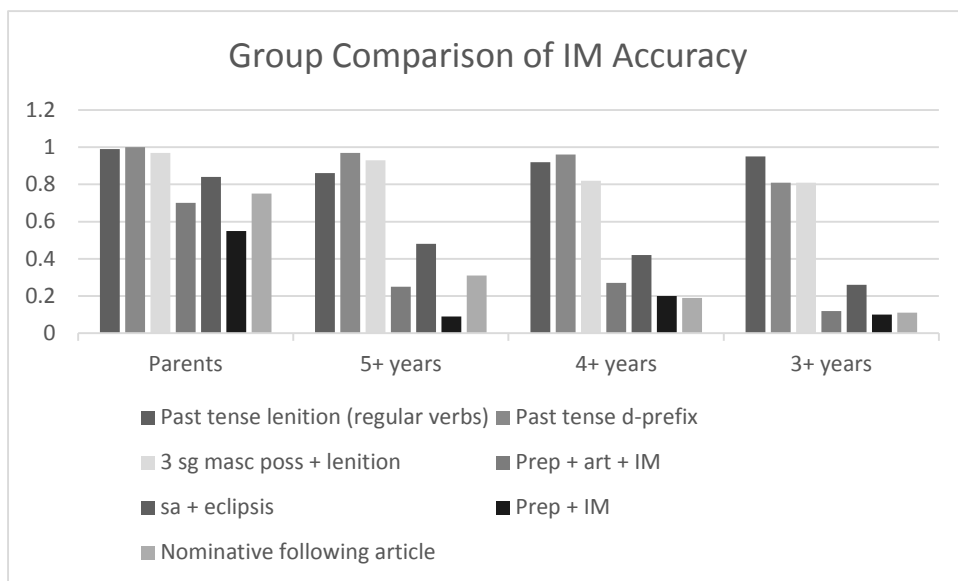


Figure 1: Group Comparison of IM Accuracy

Figure caption

Figure 1: Group Comparison of IM Accuracy

## Supplemental Material

### Story 1 and Story 2

#### Story 1 “Frog Where Are You?” (Mayer, 1969) – Irish version

1. Uair amháin bhí buachaill ann agus bhí frog agus mada mar pheataí aige.
2. Gach oíche chuireadh sé an frog a chodladh i gcrúsca mór ina sheomra codlata.
3. Ach oíche amháin nuair a bhí sé féin agus a mhada ina gcodladh, léim an frog ón gcrúsca agus amach an fhuinneog leis.
4. An mhaidin dár gcionn, bhí iontas orthu feiceáil go raibh an frog imithe.
5. Bhreathnaigh an buachaill isteach ina bhuataisí ach ní raibh an frog ann.
6. Agus bhí an mada ag cuartú an frog freisin ach nuair a thriáil sé breathnú isteach sa gcrúsca chuaigh a chloigeann i bhfostú ann.
7. Ghlaigh an buachaill amach an fhuinneog “A fhroig, frog, cá bhfuil tú?”.
8. Luigh an mada amach thar an bhfuinneog freisin agus an crúsca fós ar a chloigeann aige.
9. Ach bhí an crúsca chomh trom sin gur thit an mada ar mhullach a chinn amach an fhuinneog.
10. D’árdaigh an buachaill an mada le bheith cinnte go raibh sé ceart go leor.
11. Ní raibh an mada gortaithe ach bhí an crúsca briste ina smidiríní.
12. Ní raibh an buachaill sásta leis an mada ach bhí an mada sásta mar ní raibh an crúsca ar a chloigeann a thuilleadh.
13. Chuaigh an buachaill agus an mada amach i dtreo na gcrainnte a bhí in aice le teach an bhuachalla.
14. Ghlaigh an buachaill amach arís “A fhroig, tá muid ag tíocht le tú a chuartú, cá bhfuil tú?”
15. Ghlaigh an buachaill isteach i bpoll a bhí sa talamh an fhad is a bhí an mada ag léim suas agus ag cur as do roinnt beacha a bhí thuas i nhead beiche thuas i gcrann.(bzzzzz)
16. Go tobann, chuir lucháin olc a chloigeann amach as an bpoll agus bhain sé plaic as srón an bhuachalla.
17. An fhad is a bhí sé sin ag tarlú bhí an mada fós ag cur as dho na beacha bochta.
18. Bhí sé ag léim suas agus ag tafann orthu. (woof woof)
19. Leag an mada an nhead beiche ón gcrann agus d’éitil na beacha uilig amach aisti.
20. Bhí na beacha olc leis an mada mar scrios sé a dteach.
21. Ach ní raibh an buachaill ag tabhairt aon aird ar an mada.

22. Bhí poll mór tugtha faoi dearadh aige thuas i gcrann.
23. Mar sin suas leis sa gcrann agus ghlaoigh sé isteach sa bpoll “A fhroig, frog, an bhfuil tú istigh ansin?!”
24. Ach ní frog a bhí sa bpoll ach ulcabhán mór donn.
25. Go tobann, d’éitil an t-éan mór amach as an bpoll agus leag sé an buachaill ar a dhroim ar an talamh.
26. Rith an mada thairis chomh tapaidh agus a bhí sé in ann mar bhí na beacha uilig ina dhiaidh.
27. Rith an buachaill ón ulcabhán chomh fada le carraig mhór.
28. Suas leis ar an gcarraig agus ghlaoigh sé amach arís “A Fhroig, cá bhfuil tú?!”
29. Rug sé greim ar roinnt craobhachaí ionas nach dtitfeadh sé.
30. Ach ní craobhachaí a bhí iontu dáiríre ach adharca fia.
31. O! Go bhfóire Dia orainn bhí an buachaill i bhfostú ar chloigeann an fhia mhóir!
32. Ansin thosaigh an fia ag rith leis an mbuachaill fós i bhfostú ar a chloigeann aige.
33. Rith an mada in éindí leo.
34. Go tobann, chonaic an fia aill.
35. Stop sé ag rith agus thit an buachaill agus an mada thar imeall na haille.
36. Bhí lochán uisce faoi bhun na haille agus thit siad isteach i mullach a chéile.
37. Nach ann a bhí an splais mór uisce!
38. Go tobann chuala an buachaill rud éigin taobh thiar dho chrann a bhí sa lochán.
39. “Shhh!” a dúirt sé leis an mada, “airím rud éicint,
40. “tá mé chun breathnú taobh thiar dhon chrann”.
41. Go deas réidh bhreathnaigh siad taobh thiar dhon chrann
42. Agus cé a bhí ann ach frog an bhuachalla.
43. Agus bhí mamaí frog in éindí leis.
44. Bhí roinnt frogannaí beaga ann freisin.
45. “Ó sin áit ina bhfuil tú!” a dúirt an buachaill “agus tá frogannaí beaga agat freisin!”
46. Léim ceann dho na frogannaí beaga i dtreo an bhuachalla.
47. Thaitnigh an buachaill leis an bhfrog beag seo agus bhí sé ag iarraidh dhul abhaile leis agus a bheith mar pheata aige.
48. Bhí an buachaill agus an mada an-an-sásta peata nua a bheith acu.
49. Nuair a bhí an buachaill ag imeacht óna sheanchara agus a chlann nua, dúirt sé “slán, tabharfaimid aire mhaith dhó”.

## Story 2

### Irish

An cuimhin leat go ndeachaigh ceann de na frogannaí beaga abhaile leis an mbuachaill. Bhuel seo d'iad na frogannaí beaga eile, a dheartháireachaí agus dheirfiúrachaí ...

#### Story 2:

1. Tá siad brónach.
2. Airíonn siad a ndeartháir uathu.
3. Ba mhaith leo a ndeartháir a fheiceáil.
4. Tosnaíonn péire acu ag smaoineamh, “b’fhéidir go bhféadfadh muid dhul ar cuairt chuige”.
5. An mhaidin dár gcionn, éríonn siad as a leapacha.
6. Cuireann siad orthu a mbuataisí dubha.
7. Tógann sise a bláth léi agus tugann sí a mhála dhó.
8. Le chéile, léimeann siad thar chraobh mhór amháin agus imíonn siad faoi cheann eile atá i bhfad níos mó ná an chéad cheann.
9. Téann siad trí lochán uisce.
10. Téann siad suas cnoc.
11. Téann siad idir dhá chrann mhóra.
12. Agus ar a mbealach feiceann siad an fia mór, an t-ulcabhán donn, na beacha bochta agus an luchaín olc.
13. Chomh maith leo siúd, feiceann siad cait, caoirigh, agus capla.
14. Faoi dheireadh, tagann siad ar theach an bhuachalla.
15. Agus tá siad chomh sásta a ndeartháir a fheiceáil.
16. Suíonn siad ag ithe seacláide lena ndeartháir agus a chairde nua, an buachaill agus an mada. (yum yum yum).
17. Agus iad ag imeacht, deireann siad “slán, tiocfaimid ar ais arís go luath agus an chéad uair eile tabharfaimid Mamaí agus Daidí linn!”



## Story 2

### English translation

Do you remember that one of the baby frogs went home with the boy? Well these are the other baby frogs, his brothers and sisters ...

#### Story 2:

1. They're sad.
2. They miss their brother.
3. They want to see him.
4. Two of them start to think "maybe we could go and visit him."
5. The next morning, they get out of their beds.
6. They put on their black boots.
7. She takes her flower with her and gives him his bag.
8. Together, they jump over a big branch and they go under another one that's much bigger than the first one.
9. They go through a little lake.
10. They go up a hill.
11. They go between two big trees.
12. And on their way they see the big deer, the brown owl, the poor bees and the angry mouse.
13. As well as those, they see cats, sheep and horses.
14. At last they come to the boy's house.
15. And they're so happy to see their brother.
16. They sit eating chocolate with their brother and his new friends the boy and the dog. (yum yum)
17. As they're leaving, they say "bye, we'll come back again soon and next time we'll bring Mammy and Daddy with us!"